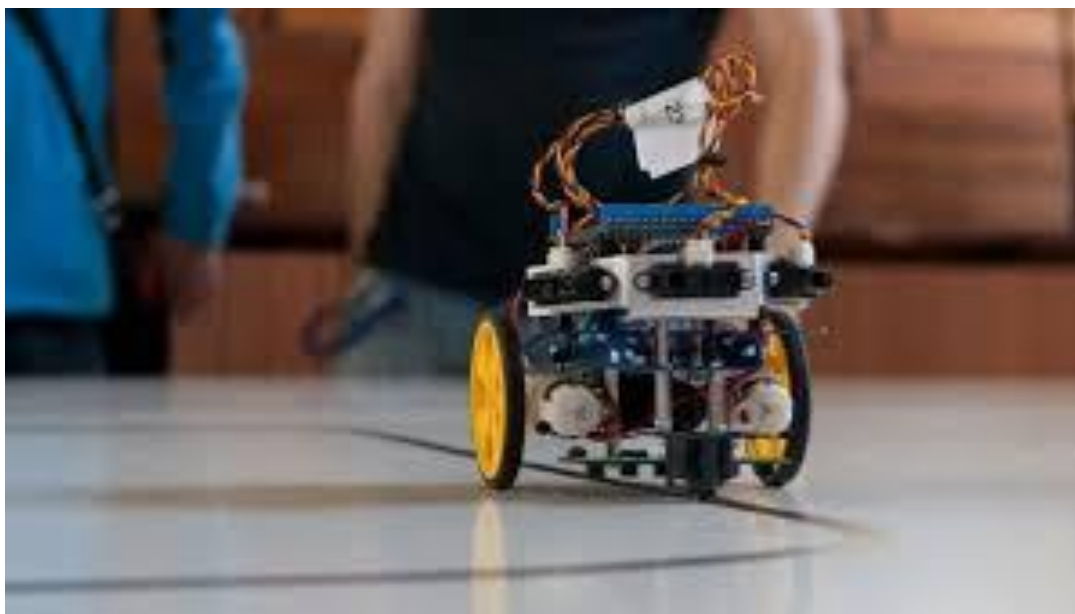




Remote workshop for line following robot



Practice 1 – Programming the Arduino Theoretical Concepts Questionnaire

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Student Name:

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Theoretical Concepts Questionnaire

1. Which function in an Arduino sketch is executed only once when the microcontroller starts or is reset?
 - a. void loop()
 - b. void setup()
 - c. void start()
 - d. void init()

2. In Why is an I2C connection preferred for the 16x2 LCD display?
 - a. It reduces the number of pins required from 12 to 4.
 - b. It makes the display brighter.
 - c. It eliminates the need for any liquid crystal library.
 - d. It allows the LCD to display colors other than blue.

3. What is the primary purpose of a H-Bridge (like the L298N) in the Autonomous Line-Following Robot project?
 - a. To regulate the battery voltage to exactly 5V.
 - b. To control the speed and direction of DC motors.
 - c. To convert analog sensor signals to digital.
 - d. To provide wireless connectivity to the robot.

4. Which component is used in to detect if the classroom is "too noisy"?
 - a. Sound sensor (FC-04)
 - b. Ultrasonic sensor
 - c. Piezo buzzer
 - d. Potentiometer

5. If a red LED requires 20mA and the output is 5V, why is a 220 Ohm resistor selected?
 - a. It is the closest standard value to the calculated 250 Ohms.
 - b. It is the only resistor that works with Arduino.
 - c. Because red LEDs always require 220 Ohms regardless of voltage.
 - d. To increase the current above 50mA.

6. In the "System Presence" project (C1), what is the function of the RFID reader?
 - a. To measure the distance between the student and the desk.
 - b. To uniquely identify students based on their ID cards.
 - c. To store the student's name directly on the card.
 - d. To provide power to the Arduino wirelessly.

7. What type of motor is used in Cat Tool to change the laser's direction?
 - a. Servo motor
 - b. DC motor
 - c. Vibration motor
 - d. Hydraulic motor

8. Which sensor is used to mimic a car's parking sensor?
 - a. Alcohol sensor
 - b. Ultrasonic sensor
 - c. Water flow sensor
 - d. Keypad

9. In Dot Matrix, what is the goal of the task?
 - a. To display alternating characters like smiley faces.
 - b. To measure the temperature of the room.
 - c. To control a stepper motor with a matrix.
 - d. To connect the Arduino to the internet.

10. What must you do in Keypad to indicate that your student number is "ready"?
 - a. Wait for 10 seconds.
 - b. Turn off the Arduino.
 - c. Press the '#' key.
 - d. Press the 'A' key.

11. What is the primary difference between Arduino and Raspberry Pi?
 - a. Arduino is a microcontroller; Raspberry Pi is a single-board computer.
 - b. Arduino has no pins for sensors.
 - c. Raspberry Pi cannot be programmed in Python.
 - d. Arduino is much more expensive than Raspberry Pi.

12. In the Autonomous Robot manual (WP3), Activity 3 involves creating an Algorithm Flowchart. Why?
 - a. To visually represent the logic of the code before writing it.
 - b. To design the 3D shape of the robot's wheels.
 - c. To calculate the battery life of the robot.
 - d. To translate the code into Spanish.

13. What is the purpose of the Test preparation?
 - a. To buy the electronic components from a store.
 - b. To describe the steps and plan for testing the circuit and program.
 - c. To write the final code for the robot.
 - d. To draw the circuit diagram in Tinkercad.

14. Alcohol sensor warns that a check will be performed by the instructor. Why?
 - a. Because alcohol is not permitted in the school environment.
 - b. Because the sensor is very expensive.
 - c. Because the sensor requires high voltage (220V).
 - d. To calibrate the sensor using a professional breathalyzer.

15. Which software function is used to send data from the Arduino to the computer screen for debugging?
 - a. digitalWrite()
 - b. Serial.println()
 - c. analogRead()
 - d. delay()

16. In the Weighing sensor, where should the weight in grams be displayed?
 - a. On the Dot Matrix.
 - b. Only in the Serial Console.
 - c. On an OLED screen.
 - d. On the student's mobile phone.

17. What does a Water sensor actually measure to determine depth?
 - a. Conductivity across the traces when submerged.
 - b. The weight of the water.
 - c. The speed of the waves.
 - d. The temperature of the liquid.

18. In the SD Card Reader , what information is stored in "route.txt"?
 - a. Decisions like "left", "right", or "straight ahead"
 - b. Photos of the route taken by a camera.
 - c. The GPS coordinates of the school.
 - d. The entire source code of the Arduino.

19. What is the function of the "delay(500)" command?
 - a. Wait for 0.5 seconds before moving to the next line of code.
 - b. Wait for 500 seconds.
 - c. Repeat the loop 500 times.
 - d. Increase the brightness by 500 units.

20. what must a developer do after testing?
 - a. Update all documentation and implement changes based on results
 - b. Throw away the circuit and start from zero.
 - c. Immediately delete the test report.
 - d. Ask a classmate to do the adjustments.

Theoretical Concepts Questionnaire. Solutions

1. Which function in an Arduino sketch is executed only once when the microcontroller starts or is reset?
 - e. void loop()
 - f. **void setup()** This function is used to initialize variables, pin modes, or libraries at the very start of the program before the main loop begins.
 - g. void start()
 - h. void init()

2. In Why is an I2C connection preferred for the 16x2 LCD display?
 - e. **It reduces the number of pins required from 12 to 4.** is a serial protocol that allows communication using only two data lines (SDA/SCL) plus power and ground, which simplifies wiring significantly
 - f. It makes the display brighter.
 - g. It eliminates the need for any liquid crystal library.
 - h. It allows the LCD to display colors other than blue.

3. What is the primary purpose of a H-Bridge (like the L298N) in the Autonomous Line-Following Robot project?
 - e. To regulate the battery voltage to exactly 5V.
 - f. **To control the speed and direction of DC motors.** Microcontrollers cannot provide enough current directly to drive motors. The H-Bridge acts as a power interface that can reverse polarity to change motor direction
 - g. To convert analog sensor signals to digital.
 - h. To provide wireless connectivity to the robot.

4. Which component is used in to detect if the classroom is "too noisy"?
 - e. **Sound sensor (FC-04)** - The FC-04 sound sensor module detects ambient sound levels and outputs a signal when a certain noise threshold is exceeded.
 - f. Ultrasonic sensor
 - g. Piezo buzzer
 - h. Potentiometer

5. If a red LED requires 20mA and the output is 5V, why is a 220 Ohm resistor selected?
 - e. **It is the closest standard value to the calculated 250 Ohms.** Using Ohm's Law ($V = IR$), the ideal value is 250Ω . 220Ω is a standard commercial value that protects the LED while maintaining good brightness.
 - f. It is the only resistor that works with Arduino.
 - g. Because red LEDs always require 220 Ohms regardless of voltage.
 - h. To increase the current above 50mA.

6. In the "System Presence" project (C1), what is the function of the RFID reader?
 - e. To measure the distance between the student and the desk.
 - f. **To uniquely identify students based on their ID cards.** RFID readers pick up the unique serial number (UID) of a tag to trigger attendance logic (present/absent) in the system.
 - g. To store the student's name directly on the card.
 - h. To provide power to the Arduino wirelessly.

7. What type of motor is used in Cat Tool to change the laser's direction?
 - e. **Servo motor** – Servos are ideal for precise angular positioning (0-180 degrees), which is necessary to move a laser to specific coordinates
 - f. DC motor
 - g. Vibration motor
 - h. Hydraulic motor

8. Which sensor is used to mimic a car's parking sensor?
 - e. Alcohol sensor
 - f. **Ultrasonic sensor** - Ultrasonic sensors (like the HC-SR04) measure distance by timing the echo of sound waves, exactly how real car parking sensors work.
 - g. Water flow sensor
 - h. Keypad

9. In Dot Matrix, what is the goal of the task?
 - e. **To display alternating characters like smiley faces.** The task specifically asks to show three types of characters (like faces) to indicate student satisfaction levels.
 - f. To measure the temperature of the room.
 - g. To control a stepper motor with a matrix.
 - h. To connect the Arduino to the internet.

10. What must you do in Keypad to indicate that your student number is "ready"?
 - e. Wait for 10 seconds.
 - f. Turn off the Arduino.
 - g. **Press the '#' key.** - Using the '#' character as an "enter" or confirmation signal for the input string.
 - h. Press the 'A' key.

11. What is the primary difference between Arduino and Raspberry Pi?
 - e. **Arduino is a microcontroller; Raspberry Pi is a single-board computer.** – Arduino runs code directly on the hardware ("bare metal"), while Raspberry Pi runs a full Operating System (Linux) and can perform multiple tasks at once.
 - f. Arduino has no pins for sensors.
 - g. Raspberry Pi cannot be programmed in Python.
 - h. Arduino is much more expensive than Raspberry Pi.

12. In the Autonomous Robot manual (WP3), Activity 3 involves creating an Algorithm Flowchart. Why?
 - e. **To visually represent the logic of the code before writing it.** – Flowcharts help map out the decision-making process (e.g., "if sensor sees black, turn right") before the complexity of actual coding.
 - f. To design the 3D shape of the robot's wheels.
 - g. To calculate the battery life of the robot.
 - h. To translate the code into Spanish.

13. What is the purpose of the Test preparation?
 - e. To buy the electronic components from a store.
 - f. **To describe the steps and plan for testing the circuit and program.** - Planning test activities in advance ensures that all functionalities are systematically verified and no errors are missed.
 - g. To write the final code for the robot.
 - h. To draw the circuit diagram in Tinkercad.

14. Alcohol sensor warns that a check will be performed by the instructor. Why?
 - e. **Because alcohol is not permitted in the school environment.** - This is a safety and policy warning; the instructor must handle the testing substance because alcohol is prohibited for students.
 - f. Because the sensor is very expensive.

- g. Because the sensor requires high voltage (220V).
 - h. To calibrate the sensor using a professional breathalyzer.
15. Which software function is used to send data from the Arduino to the computer screen for debugging?
- e. digitalWrite()
 - f. **Serial.println()** - Serial.println() sends text data to the Serial Monitor on your computer, which is the primary way to debug and see sensor values.
 - g. analogRead()
 - h. delay()
16. In the Weighing sensor, where should the weight in grams be displayed?
- e. On the Dot Matrix.
 - f. Only in the Serial Console.
 - g. **On an OLED screen.** - The project requirements specifically state that a phone scale should be made using a weighing sensor and an OLED screen.
 - h. On the student's mobile phone.
17. What does a Water sensor actually measure to determine depth?
- e. **Conductivity across the traces when submerged.** - As water level rises, it covers more of the metal traces on the sensor, changing the resistance/conductivity, which the Arduino reads as an analog value
 - f. The weight of the water.
 - g. The speed of the waves.
 - h. The temperature of the liquid.
18. In the SD Card Reader , what information is stored in "route.txt"?
- e. **Decisions like "left", "right", or "straight ahead".** - The SD card is used to store a text-based description of a route created by the user through an XY controller.
 - f. Photos of the route taken by a camera.
 - g. The GPS coordinates of the school.
 - h. The entire source code of the Arduino.

19. What is the function of the "delay(500)" command?

- e. **Wait for 0.5 seconds before moving to the next line of code.** - The delay function uses milliseconds. Since 1000ms = 1s, 500ms is exactly half a second.
- f. Wait for 500 seconds.
- g. Repeat the loop 500 times.
- h. Increase the brightness by 500 units.

20. What must a developer do after testing?

- e. **Update all documentation and implement changes based on results** - The final stage of the development cycle is to adjust the project based on test failures and ensure all documents (plans, reports) match the final version.
- f. Throw away the circuit and start from zero.
- g. Immediately delete the test report.
- h. Ask a classmate to do the adjustments.